CHAPTEE XVIII

THE CHEMICAL ACTION OF THE FLAME

(a) FORMATION OF SCALE.

METALLIC iron has great attraction to unite with oxygen, and this affinity grows with rise in temperature. As stated at the commencement, there originates from the combination of 1 kilogramme 0 with Iron, free heat in amounts of 4,800 to 4,600 calorics, whilst Its union with hydrogen to form steam yields 3,645 calories, and with carbon monoxide to form carbon dioxide yields 4,205 calories. On heating metallic Iron in an atmosphere which contains oxygen, water-vapour, or carbonic acicl, there always results a change in the Iron, which takes up oxygen and damages its metallic surface. The strongest reaction would naturally take place with oxygen in Its free state, but should this nevertheless not be at disposal, oxygen will be taken from water-vapour and carbonic acid. Now carbonic acid and water-vapour form substantial constituents of every flame, one and the same If its qualities constitute It an oxidising or a so-called reducing ilame. Therefore it is impossible to subject Iron to direct action of any such flame without the outer surface receiving a covering of iron-oxygen compounds. The resulting substance is termed " scale." By continual attack Its amount grows, and there originates on tho Iron a crust, which, by shattering or by change of the form of the metal, can be made to fall off; for example, in forging or rolling. The scale then Is called hammer scale or roll scale. Its composition, according to Wedding, lies between the limits PeaOs+ 4FeO and FeA (or pure iron-oxide), and Is on the average It It substantially independent of the composition of the heated iron, and scale originates equally well on the softest